It is very difficult to give an opinion on the affinities of this strange little organism, except that it is a Vertebrate and probably a fish. It is certainly not a Placoderm, its resemblance to a supposed "baby *Coccosteus*" being entirely deceptive. The appearance of the head does remind us in a strange way of the primitive skull of *Myxine*, a resemblance which is rendered still more suggestive by the apparent complete absence of lower jaw or of limbs or limb-girdles. But a Myxinoid with ossified skeleton including differentiated vertebral centra is, it must be owned, a rather startling idea! But as it requires a name in the meanwhile, I cannot think of any one more appropriate than *Palæospondylus Gunnii*.

LX.—*The Fauna of Amber.* By Herr Richard Klebs, of Königsberg *.

The above is the title of a paper read before the Entomological Section of the 'Versammlung deutscher Naturforscher und Aertzte,' at Heidelberg, on Sept. 21, 1889. With a view to obtaining a large amount of material thoroughly suitable for working, Herr Klebs had communicated with Messrs. Stantien and Becker, of Königsberg, who enjoy the monopoly of the amber trade, and who placed their entire stock at his disposal. The result has been that during the last twelve years several hundred thousand pieces containing specimens have passed through his hands, and of these he has arranged and catalogued about twenty-five thousand of the best-preserved and most valuable. In addition to this Herr Klebs has arranged and catalogued other collections, including that formed by Künow, which comprises twelve thousand specimens, and has recently been purchased by the Prussian government.

Thirty years ago a paper was read by Löw before the same society on the Dipterous fauna of amber. Unfortunately it was but a passing glimpse which Löw was able to give of the Tertiary forms of this order of insects, which attained so high a degree of development during that period; and Löw died before completing his work. But what little he then communicated excited general interest. Herr Klebs instances the genera *Electra* and *Chrysothemis*, which are

* Condensed from the 'Biologisches Centralblatt,' Bd. x. nos. 13 and 14, pp. 444–448, August 15, 1890.

intermediate forms between gnats and Brachycerous flies. Hagen has more recently given us a very exhaustive treatise on quite a small group of amber insects—the Psocidæ; while the ants have been examined by Meyer. Apart from a few small memoirs, this includes the whole of the work which has hitherto been done on this interesting subject. Berend's work on the organic remains in amber, published in 1854, is of but little value for purposes of identification.

The chief obstacle which has hitherto militated against the proper working out of these treasures, of such extreme importance for palæontology and zoology, lay in the fact that the bulk of the material was not selected with sufficient care and was altogether insufficiently prepared. Künow was the first to polish the pieces of amber containing specimens in such a way that they can be examined with the microscope with almost greater facility than preparations of existing forms. It was owing to this that Hagen, in his recent work on the Psocidæ, the material for which was entirely derived from the Künow collection, was able to furnish such interesting data for the phylogeny of this group from the Tertiary period to the present time. In preparing the specimens as much as possible of the surrounding amber was first removed, and then, after polishing, they were imbedded in a hard resinous matrix of approximately the same refractive index as amber. By this means the amber enclosing the specimen is permanently preserved from efflorescence and that loss of transparency, which have worked such havoc among old and valuable collections. Herr Klebs has so arranged this process that it can be employed for the preservation of blocks of amber containing a number of specimens, by which scientific examination is facilitated, while the specimens themselves are rendered very suitable for exhibition purposes in museums.

After these introductory remarks Herr Klebs proceeds to summarize the results of his investigations.

Among the creatures imprisoned in amber the Diptera are most numerously represented, and material to the amount of at least twenty thousand perfectly preserved examples has been collected. Nematocera and Brachycera are present in about equal numbers. The Pupipara and Aphaniptera are so far conspicuous by their absence. As regards the richness in species of certain of the genera represented in amber, it was found by Löw that, for example,

Chironomus	has at least		40	species.
Ceratopogon	„	„	26	„
Cecidomyia	„	„	9	„
Sciara	„	„	21	„
Mycetophila	„	„	23	„
Sciobia	„	„	16	„
Sciophila	„	„	15	„
Platyura	„	„	16	„

Of Dolichopodidæ Löw was able to distinguish at least sixty-eight different species. The rest of the families of Diptera, with very few exceptions, also have their representatives in the fauna of amber. Species have been discovered quite recently which attract attention owing to their peculiar shape, and which, to the best of Herr Klebs's knowledge, are widely separated from existing forms. He instances a large Dipteron lately discovered which possesses extraordinarily large antennæ branched like the antlers of a stag *.

Of the Hymenoptera all the groups are represented, with the exception of the Braconidæ and Evaniadæ. The Uroveridæ, however, are limited to two large species of *Sirex* which Herr Klebs has lately discovered.

The Coleoptera, with about four thousand examples, possess representatives of a number of families. Out of a total of seventy-five families twenty-six are so far missing. These are :—

Cicindelidæ.
Hydrophilidæ.
Clavigeridæ.
Anisotomidæ.
Sphaertidæ.
Scaphidiidæ.
Rhyssodidæ.
Mycetophagidæ.
Thorictidæ.
Throcidæ.
Georyssidæ.
Parnidæ.
Heteroceridæ.
Lucanidæ.
Scarabæidæ.
Cebrionidæ.
Melyridæ.
Cioidæ.
Pimmellidæ.
Diaperidæ.
Helopidæ.
Lagriidæ.
Rhipiphoridæ.
Meloidæ.
Salpingidæ.
Corylophidæ.

But besides the Coleoptera which have been allotted to

* [In all probability Herr Klebs is mistaken in speaking of these processes as *antennæ*. They are most likely special cuticular developments, as in the case of the remarkable genus *Elaphomyia*, founded by Saunders for certain forms discovered by Wallace in the Malay Archipelago, the types of which are in the British Museum. These have a pair of antler-shaped chitinous processes springing from the head, quite distinct from the antennæ, which are in the normal position.—Transl.]

their respective families Herr Klebs finds himself unable to assign about 33 per cent. of the beetles which he has examined, in spite of their excellent preservation. Although, in consequence of the material differences which they exhibit, they can scarcely belong to the families already represented, it is nevertheless quite possible that many a representative of the missing families may be hidden away among them. Herr Klebs cites the genus *Lymexilon* as an instance of the way in which occasionally solitary forms, hitherto unknown as Tertiary, suddenly turn up in some numbers. He discovered the first amber specimen of *Lymexilon* in the autumn of 1888; a year later he had discovered no less than six specimens of the genus, comprising at least three different species. *Lymexilon* is at the present time an extremely rare genus, which lives in rotten oak, and of which only a solitary local species has hitherto been found in Europe.

Of the Neuroptera, the Phryganidæ, of which about five thousand examples have been discovered, are the most numerous; next come the Hemerobiidæ, with about fifty specimens, the Panorpidæ, with twenty-five, and occasional examples of Semblidæ.

The Orthoptera are represented by nearly two thousand five hundred specimens, the Blattidæ being most numerous; next, arranged in order of frequency, come the Lepismidæ, Gryllidæ, Poduridæ, Locustidæ, Pseudoperlidæ, Phasmidæ, Forficulidæ, and lastly the Mantidæ. No specimens of Campodidæ nor Acrididæ have as yet been found, though possibly specimens of *Niceletia* and *Campodea* may have been included among the larvæ.

Among about one thousand specimens of Pseudoneuroptera the Termites are most numerous, numbering about two thirds of the whole, while Thripsidæ, Psocidæ, Perlaridæ, Ephemeridæ, and Libellulidæ are present in about equal numbers, the Psocidæ being perhaps somewhat more numerous than the rest. The Embiidæ are very rare.

The Lepidoptera, to the number of about one thousand specimens, are all with one exception Micros, belonging to the families Tortricidæ, Tineidæ, and Psychidæ. The solitary Macrolepidopteron, which is one of Herr Klebs's recent discoveries, is a tolerably large *Arctia*.

The Rhynchota, with about twelve hundred examples, exhibit representatives of all the subdivisions, with the exception of the Pediculina. Aphididæ and Homoptera (Cicadidæ) are the most numerous; next come the Hemiptera, and lastly the Coccidæ. Myriopoda, both Chilopoda and Chilognatha, are represented by about one hundred and fifty specimens.

Of Arachnoidea at least two thousand five hundred specimens have been found, the majority of which belong to the Araneida, which are remarkably rich in genera and species. Herr Klebs mentions that at least six species of the extinct genus *Archæa* have been observed. The Acarina too are numerous, and it is interesting to note that Herr Klebs has recently discovered an *Ixodes*. The Phalangida are represented by about thirty specimens and the Pseudoscorpionida by about the same number. Of the true Scorpions only a single example is known, and has been described by Menge as *Tityus cogenus*. Pedipalpi and Solifugæ are wanting as yet.

The Crustacea, with the exception of one Amphipod, which Zaddach has worked out, are represented by Isopods only. About fifty specimens, belonging to a number of genera and species, have been found.

Of larvæ and larva-cases some fifteen hundred specimens have been found; but Helminthes, such as *Mermis* and *Anguillula*, are only occasionally met with.

The Mollusca are represented by twelve specimens, belonging to eleven different species. Among these Herr Klebs has distinguished and described the genera *Pormocella, Hyalina, Strobilus, Myorocystis, Vertigo, Balæa*, and *Electræa*, his determinations being for the most part confirmed by Sandberger. In addition to these he has recently acquired a couple of beautifully preserved Mollusks; one of these is a *Vertigo* and the other very closely allied to the large Streptaxids.

Vertebrate inclosures in amber are extremely rare and are principally confined to solitary feathers and tufts of hair; the only other specimen belonging to this group with which Herr Klebs is acquainted being a lizard, which Dr. Böttger, of Frankfurt, supports him in considering to be very closely allied to *Knemidophorus*, an exclusively American and for the most part tropical form. Of the seventeen known species one is also found in North America.

So far as can be judged from the representatives of the amber fauna hitherto examined, their nearest allies at the present day occur in North America and Eastern Asia. Notably is this the case in the Diptera. This fact had already been noticed by Löw, who, when examining the North-American Diptera, discovered isolated representatives of a number of genera (*Electra, Chrysothemis*, &c.) which he had previously believed to be exclusively Tertiary. Baron Osten-Sacken has since confirmed Löw's conclusions, and in looking over the material which Löw had collected has discovered very numerous relations between the amber fauna and that of North

America. Herr Klebs's examination of the amber Mollusca produced a similar result, and in this case Eastern Asiatic types were also found. There is, however, nothing at all surprising in this—it was only to be expected; for relations have long been known to exist between the fauna and flora of North America and Eastern Asia on the one hand and between this and our Central European Tertiary fauna and flora on the other. Herr Klebs instances the tuberculated *Unios*, the Paludinæ, &c. Still more striking would be this agreement if the at present merely provisional assignment of the above-mentioned lizard to the immediate neighbourhood of *Knemidophorus* should be confirmed upon closer examination. The works of Caspary and Conwenz on the flora of amber also lead mainly to the same result.

Herr Klebs concludes by remarking that, with the exception of the Psocidæ and Gasteropoda, some fifty specimens in all, no portion of the amber fauna has as yet been exhaustively worked out; and he appeals to entomological specialists in particular to put themselves in communication with him, in order that the study of the rich material which he has amassed may be undertaken in a manner befitting its importance.

LXI.—*Observations on some Fossil Fishes from the Lower Carboniferous Rocks of Eskdale, Dumfriesshire.* By R. H. Traquair, M.D., F.R.S.

Since the publication of the first part of my "Report" on the fossil fishes obtained by the Geological Survey of Scotland in Eskdale and Liddesdale a considerable quantity of new material has been collected in this district, as well by the Survey as also by Mr. Jex, collector to Mr. Damon, of Weymouth, and by Mr. T. Stock and others. Prior to the publication of a second part of the "Report," I propose in the present instance to make a few remarks on some of the specimens which were procured from the late Mr. Robert Damon for the Edinburgh Museum of Science and Art.

Acanthodes nitidus, A. S. Woodward.

Characterized by having the ventral spines more posteriorly situated than in other Carboniferous species of the genus. I had intended naming this species, but as my friend Mr. A. Smith Woodward informs me that he had independently diagnosed and named it in the second part of his 'Catalogue of the Fossil Fishes in the British Museum,' now in the press, I have pleasure in adopting his name.